

Testimony of Dr. Edwin Lyman
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“Examining America’s Nuclear Waste Management and Storage”
Before the
Oversight and Government Reform Committee
Subcommittee on the Interior, Energy and Environment
U.S. House of Representatives
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SUMMARY OF UCS TESTIMONY

- UCS believes that spent fuel can be managed safely at reactor sites for decades, but only if spent fuel is expeditiously transferred from cooling pools to dry casks to reduce the risk of catastrophic spent fuel pool fires, and that the security of dry cask storage is enhanced.
- Congress should not weaken the linkage between monitored retrievable storage (MRS) facilities and geologic repositories established in the Nuclear Waste Policy Act unless it also acts to ensure that MRS facilities do not become de facto permanent repositories.
- Many people believe that nuclear waste disposal is only a political problem, and not a technical problem. In fact, it is both. One should not underestimate the technical challenges of designing and building a repository that will effectively isolate nuclear waste from the environment for hundreds of thousands of years. The foundation of such an effort is good science. One of the most effective ways that Congress could improve the prospects for a geologic repository is to fully support the scientific work needed to establish the technical basis for its safety and security.

Good afternoon. On behalf of the Union of Concerned Scientists, I would like to thank Chairman Farenthold, Ranking Member Plaskett, and the other distinguished members of the Subcommittee for the opportunity to provide our views on nuclear waste management and disposal policy in the United States.

Before I begin, I would like to extend our sympathies and best wishes for a swift and full recovery to the people of Texas, the U.S. Virgin Islands, and all the other areas that have been so deeply affected by Hurricanes Harvey, Irma and Maria.

The Union of Concerned Scientists (UCS) has more than half a million supporters, united by a central belief: that we need sound scientific analysis to create a healthy, safe, and sustainable future. UCS is neither pro- nor anti-nuclear power, but has served as a nuclear power safety and security watchdog for nearly fifty years. Combating the threat of global climate change is one of our priorities, and we have not ruled out an expansion of nuclear power as an option to help reduce greenhouse gas emissions—provided it is affordable relative to other low-carbon options and that it meets high safety and security standards. These considerations apply as well to the management and disposal of spent nuclear fuel, which contains long-lived, highly radioactive fission products and weapon-usable plutonium. It is critically important that spent fuel be managed safely and protected from terrorist attack until it can be buried in a geologic repository. But a sustainable nuclear waste disposal strategy must also have broad public acceptance at local, state, and national levels.

The witnesses today were asked to focus on the needs and challenges of communities currently holding nuclear waste. While we agree that those communities must have a major stake in the process, we believe that a sound nuclear waste policy should also reflect national priorities and look to protect future generations as well as ours. The problem is that actions that may appear to benefit some communities in the short term can penalize others, and may even be harmful to the long-term interests of the U.S. population as a whole.

To be clear, in our view, spent nuclear fuel can be stored safely and securely at reactors in dry cask facilities for many decades, provided that the Nuclear Regulatory Commission (NRC) conducts rigorous oversight. Nevertheless, risk acceptance varies from one community to another, and it is understandable why some elected representatives would support legislation that would expedite the shipment of spent nuclear fuel out of their districts or states. This is why Congress needs to come together to develop a new and science-based national nuclear waste management and disposal policy—one that allocates risks and benefits as fairly as possible.

The main elements of such a policy should include (1) a process to establish and maintain political momentum for development of geologic repositories; (2) a process for repository site selection and approval that is consent-based, fair and technically sound; (3) requirements that spent nuclear fuel will be managed safely and securely at reactor sites until a repository becomes available; and (4) requirements for the safe and secure shipment of spent nuclear fuel from reactor sites to a final repository. Current laws and regulations do not adequately address any of these issues.

Unfortunately, the House Energy and Commerce Committee, by voting in June of this year to report out the flawed H.R. 3053, the Nuclear Waste Policy Amendments Act of 2017, appears determined to avoid confronting these questions. UCS expressed our concerns about a draft version of this bill earlier this year in testimony before an Energy and Commerce subcommittee. We disagreed with the draft bill's limited scope, its weakening of the linkage between monitored retrievable storage facilities and geologic repositories, and its Yucca Mountain-centric approach. The amended bill reported out of committee was little improved, and in some respects is even worse than the original.

Establishing and Maintaining Momentum for Repository Siting

The first version of H.R. 3053 weakened the critical linkage between the DOE's authority to store nuclear waste at consolidated monitored retrievable storage (MRS) facilities and the

development of a geologic repository, as established by the 1982 Nuclear Waste Policy Act (NWPA). The bill as amended has further weakened this linkage.

The NWPA rightly imposed tight constraints on MRS facilities because of the concern that sending nuclear waste to interim storage facilities away from reactors could derail political efforts to develop geologic repositories and result in the interim facilities becoming de facto permanent disposal sites.

The NWPA currently prevents the DOE from constructing an MRS facility until the NRC has issued a construction license for a geologic repository. H.R. 3053 would sever this linkage by allowing the DOE to immediately contract with a private company to develop an MRS, provided that state and local governments consent. This means that the DOE could use public money to pay for MRS siting, environmental reviews, licensing, permitting, site preparation, development of transportation links, and construction: all activities short of operation. However, the DOE would not be allowed to store nuclear waste it owns at such a facility until after the Nuclear Regulatory Commission (NRC) decides whether or not to authorize construction of a repository at Yucca Mountain (or declares that such a decision is “imminent”).

Even with the latter condition, we believe this MRS authorization would likely undermine the geologic repository program. If the NRC denies a construction authorization for Yucca Mountain, H.R. 3053 would not require the DOE to search for another geologic repository site, and would allow it to store nuclear waste in MRS facilities indefinitely. The quantity of nuclear waste at each MRS would remain capped at 10,000 metric tons. But if the NRC were to reject Yucca Mountain, we read the bill as then allowing the DOE to build as many MRS facilities and enter into as many MRS agreements as needed (and contingent on funding).

We also note that even if the NRC were to approve Yucca Mountain, H.R. 3053 would allow for consolidated interim storage of a large and possibly unlimited quantity of nuclear waste for an indefinite period. The bill would raise the statutory cap for Yucca Mountain from 70,000 to 110,000 metric tons of nuclear waste. While this seems like a pragmatic change, given that the United States has already accumulated well over 70,000 metric tons of nuclear waste, raising the

cap would further postpone the need to find a second repository site. Moreover, in this case as well, the MRS provision in H.R. 3053 would authorize the DOE to build as many MRS facilities as needed, eliminating the need to site a second repository at all. In either case, the outcome would be dangerous for both environmental and security reasons.

Why is there a security concern? First, an MRS facility is vulnerable to sabotage attacks that could lead to dispersal of radioactive materials. Second, spent fuel in retrievable storage will eventually become an attractive material for terrorists seeking to obtain nuclear weapons. Spent fuel contains plutonium which can be extracted by reprocessing. However, for many decades after removal from a reactor, spent fuel is highly radioactive and very difficult for terrorists to steal and reprocess. But as the fission product cesium-137 decays away over time and the spent fuel becomes less radioactive, the plutonium it contains will become more accessible.

Under the NRC's rules, when the level of radioactivity from spent fuel drops below a certain threshold (100 rem per hour at 3 feet), physical protection measures for spent fuel would have to be increased to the same strict standard that applies to separated plutonium. This would require a significant security upgrade for spent fuel in retrievable storage. Some commercial spent fuel will reach this point as soon as seventy years after being removed from the reactor. This is one reason why the nation must focus on the goal of building a geologic repository for spent fuel and making it irretrievable as soon as it is safe to do so. Once spent fuel is sealed within a deep underground facility, it will be much harder for terrorists to access.

We also note that even from the point of view of an MRS supporter, the promises offered by H.R. 3053 ring hollow. By allowing the DOE to contract for the construction of an MRS immediately but preventing the facility from operating until the NRC has made a final Yucca Mountain decision, the government could spend hundreds of millions of dollars in the near term on a facility that may not be used for many years, if ever. While H.R. 3053 also requires the NRC to make a final decision on Yucca Mountain within 30 months after its passage, it cannot enforce this mandate. After all, under the NWPA the NRC was required to make its decision no

later than October 2012. That didn't happen because the DOE stopped supporting its Yucca Mountain license application in 2010. Given past experience, there is no guarantee that future administrations will adhere to a pro-Yucca policy.

In addition, a recent GAO study outlined the formidable hurdles that would have to be overcome if the DOE decided to reactivate its Yucca license application.¹ There are nearly three hundred technical contentions that would have to be adjudicated before the NRC Atomic Safety and Licensing Board. However, the GAO noted that the DOE will need time to reconstitute a team of experts who can defend the application at the NRC. Although the GAO report is careful not to give its own estimate of how long the licensing process would actually take to complete, the report cites an NRC estimate from 2014 of 5 years to resume and complete the adjudication. Given my own experience with NRC adjudications, a period of 30 months, or anything close to it, does not seem realistic.

To address the possibility that the NRC may ultimately reject Yucca Mountain or never come to a final decision, a comprehensive nuclear waste management bill should contain mechanisms to ensure that DOE will not abandon searching for alternative repository sites. Congress should restore linkages between MRS facilities and geologic repositories, perhaps including a limit on the time that nuclear waste can be stored in any MRS facility and a limit on the combined capacity of all MRS facilities.

A More Equitable and Science-Based Repository Siting Process

UCS strongly supports the development of geologic repositories for direct disposal of spent fuel. However, we do not have the geological expertise on staff to assess the technical suitability of the Yucca Mountain site, or for that matter, any other potential site in the United States. With regard to political suitability, we concur with the assessment of the Blue Ribbon Commission Report that the process by which Yucca Mountain was selected was flawed and contributed to

¹ Government Accountability Office (GAO), "Commercial Nuclear Waste: Resuming Licensing of the Yucca Mountain Repository Would Require Rebuilding Capacity at DOE and NRC, Among Other Key Steps," GAO-17-340, April 2017.

the erosion of trust in the program that caused it to stall. Congress should pursue a different and less adversarial approach that will be more likely to lead to selection of sites that are both technically suitable and publicly acceptable. Once a process is in place, Yucca Mountain could then compete with other repository proposals on a level playing field.

In order to increase the likelihood of success, Congress needs to find an approach for repository siting that could facilitate local and regional cooperation, rather than heighten already entrenched opposition. However, H.R. 3053 goes in the wrong direction with a heavy-handed attempt by the federal government to resolve disputes by preempting state authority instead of promoting dialogue and cooperation. The state of Nevada, predictably, opposes the bill. While it may be unrealistic to hope for an all-inclusive “consent-based” siting approach, as first proposed by the 2012 report of the Blue Ribbon Commission on America’s Nuclear Future (BRC), there is surely a way to develop a process that at least is perceived by all stakeholders as fair, even though they might not all agree with the outcome.

Many people believe that nuclear waste disposal is only a political problem, and not a technical problem. In fact, it is both. One should not underestimate the technical challenges of designing and building a repository that will effectively isolate nuclear waste from the environment for hundreds of thousands of years. The foundation of such an effort is good science. One of the most effective ways that Congress could improve the prospects for a geologic repository is to fully support the scientific work needed to establish the technical basis for its safety and security.

Safety and Security of Spent Fuel Storage at Reactor Sites

A comprehensive strategy for nuclear waste management must also address the safety and security of spent fuel storage at reactor sites. Even if Yucca Mountain were to receive a license tomorrow, constructing the repository and transportation infrastructure would take time, and large quantities of spent fuel would likely remain at many reactors for decades to come. Also, for operating reactors, there will be a need to store recently discharged spent fuel on site.

Unfortunately, the NRC allows spent fuel to be stored in dangerously overloaded spent fuel pools, which exposes millions of Americans to needless risk.² If an earthquake or a terrorist attack were to damage a spent fuel pool at a U.S. reactor, causing it to rapidly lose its cooling water, the spent fuel could heat up and burn, releasing a large fraction of its highly radioactive contents into the environment. The consequences of such an event would be truly disastrous. A recent Princeton University study calculated, using sophisticated computer models, that a spent fuel pool fire at the Peach Bottom nuclear plant in Pennsylvania could heavily contaminate over 30,000 square miles with long-lived radioactivity and require the long-term relocation of nearly 20 million people, for average weather conditions. Depending on the wind direction and other factors, the plume could reach anywhere from Maine to Georgia. The impact on the American economy would be profound, and likely far worse than the estimated \$200 billion in damages caused by the much smaller release of radioactivity from the damaged Fukushima Daiichi plant, or the estimated \$180 billion in damages resulting from Hurricane Harvey's devastation.

The consequences of a terrorist attack or earthquake would be greatly reduced if nuclear plants thinned out their spent fuel pools by transferring the older fuel to dry storage casks. Yet the NRC has refused to require nuclear plants to do so, insisting in the face of all evidence that the risk is tolerable. And the industry will not voluntarily spend the money to buy additional dry casks, despite their modest cost in relation to the potential economic damages from a pool fire.

To this end, we urge Congress, as part of any nuclear waste management reform package, to address the unacceptably high risk of a spent fuel pool fire by either requiring nuclear plants to thin out their densely packed spent fuel pools by expediting transfer to dry cask storage, or by creating strong incentives for nuclear plants to do so on their own, such as a reduction in future Nuclear Waste Fee assessments. This requirement would have a valuable side benefit by adding good jobs in the dry cask storage construction industry.

² E. Lyman, M. Schoeppner and F. von Hippel, "Nuclear Safety Regulation in the Post-Fukushima Era," *Science*, May 26, 2017.

While the risk of a large radiological release is greatly reduced when spent fuel is moved from high-density pools to dry casks, it does not go down to zero. One must also be concerned about sabotage attacks on dry storage casks. Indeed, during security reviews that it ordered following the 9/11 attacks, the NRC discovered ways to sabotage dry storage casks that could cause significant radiological releases. Accordingly, it began developing new requirements for protecting dry cask storage facilities—both at reactor sites and at centralized sites—from sabotage. However, in 2015 the NRC delayed development of these new requirements for at least five years, citing resource constraints. Any new nuclear waste legislation should contain provisions to ensure that these vulnerabilities are promptly addressed.

Safety and Security of Spent Nuclear Fuel Transportation

In nearly any future system for spent nuclear fuel management, large quantities of spent nuclear fuel will need to be shipped long distances by road, rail, and waterway. Plans for ensuring that the public and the environment will be protected during such transportation are simply not adequate. Safety standards for nuclear waste transportation have changed little over the decades despite major evolutions in the nation's transportation system, such as highway speed limit increases. In the early 2000s, the NRC planned to carry out a study to evaluate whether the safety requirements for nuclear waste casks provided sufficient levels of protection, but the project was never carried out. Congress should mandate that the NRC resume this study, and provide sufficient funding for it.

Security of spent fuel during transport is also a great concern. Transportation is the weakest link in the security chain. Shipping casks may be vulnerable to the same types of attack modes as dry storage casks (and in fact some casks are designed for both transport and storage). Yet the NRC has no requirements to harden shipping casks to resist such attacks. Congress should require that the NRC shipping cask study consider these issues and whether new security standards are needed.

The United States can afford to allow the NRC to take its time in reviewing the safety of Yucca Mountain and for the DOE to locate and characterize other possible repository sites. Provided that nuclear plants thin out their high-density spent fuel pools by expediting transfer to dry casks, and other necessary upgrades are carried out, spent fuel can be stored safely and securely at reactor sites for many decades. There is no urgent need to rush forward with a less-than-optimal approach for the long term.

Thank you for your attention. I would be happy to answer your questions.